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Author(s)	Wong, WS; Chow, YF; Chen, PP; Wong, S; Fielding, R
Citation	Quality of Life Research, 2015, v. 24 n. 9, p. 2087-2097
Issued Date	2015
URL	http://hdl.handle.net/10722/216591
Rights	The final publication is available at Springer via http://dx.doi.org/10.1007/s11136-015-0955-1

**A longitudinal analysis on pain treatment satisfaction among Chinese patients with chronic pain:
Predictors and association with medical compliance and quality of life**

Wong, W. S.^{a*}, Chow, Y. F.^b, Chen, P. P.^c, Wong, S.^b, Fielding, R.^d

^aDepartment of Psychological Studies and Centre for Psychosocial Health, The Hong Kong Institute of Education, 10 Lo Ping Road, Tai Po, Hong Kong SAR, China.

^bDepartment of Anesthesiology and Operating Services, Queen Elizabeth Hospital, Kowloon, Hong Kong.

^cDepartment of Anesthesiology and Operating Services, Alice Ho Miu Ling Nethersole Hospital, Tai Po, Hong Kong.

^dSchool of Public Health, University of Hong Kong, Pokfulam, Hong Kong SAR, China.

*Corresponding author. Tel.: +852-2948-8936; fax: +852-2948-7794. Email address: wingwong@ied.edu.hk (W.S. Wong).

Declaration:

No conflict of interest declared.

This study conformed to the Helsinki Declaration concerning human rights and informed consent, and it also followed correct procedures concerning treatment of humans and animals in research.

Abstract

Background: Patient satisfaction research in chronic pain treatment is scarce internationally, and is non-existent in Chinese communities like Hong Kong. This longitudinal study examined the relationships between medical compliance, pain treatment satisfaction, and quality of life (QoL) in a sample of Chinese patients with chronic pain.

Methods: A total of 178 patients with chronic pain were assessed at baseline, 3-, and 6-month following baseline. Medical compliance and pain treatment satisfaction were assessed by the Participant Compliance Reporting Scale (PCRS) and the Pain Treatment Satisfaction Scale (PTSS) respectively. QoL, depression, pain catastrophizing, and pain-related fear were assessed using SF-12, the depression subscale of the Hospital Anxiety and Depression Scale (HADS-D), the Pain Catastrophizing Scale (PCS), and the Tampa Scale for Kinesiophobia (TSK) respectively. Linear mixed effects models (LME) were fitted to identify predictors of pain treatment satisfaction, medical compliance, and QoL.

Results: Results of univariate LME analyses showed significant quadratic time effects on 4 PTSS scores and significant associations between disability grade and PTSS scores (all $p < 0.05$). Medical compliance was not significantly associated with satisfaction regarding pain medication (Model 1). Satisfaction with medication characteristics emerged as an independent predictor of medical compliance (Model 2: $\text{std}\beta = -0.11$, $p < 0.05$) after controlling for sociodemographic and pain variables. Neither medical compliance nor pain treatment satisfaction predicted QoL outcomes (Model 3 and 4).

Conclusions: Distinct trajectories in pain treatment satisfaction were displayed in the current sample of Chinese patients with different disability grading chronic pain. Within pain treatment, only medication characteristics significantly impacted patients' medical compliance. (word count: 249)

Keywords: Pain treatment satisfaction; Chinese; chronic pain; medical compliance; quality of life.

Introduction

Patient satisfaction is an important dimension measuring care quality.^{1, 2} Assessment of patients' satisfaction with care ("satisfaction") has been utilized to both evaluate overall quality of care, and to compare treatments, patterns of care, or health care systems.³ Thus far, patient satisfaction has been largely studied in relation to symptom relief. Studies of acute medical conditions show symptom relief is associated with greater satisfaction,^{2, 4, 5} whereas symptom chronicity predicts patient dissatisfaction.⁶ However, studies of patients with chronic pain suggested the opposite: high satisfaction despite little reported symptom relief.⁷⁻¹⁰ An inverse relationship between pain intensity and patient satisfaction has also been reported.⁹⁻¹¹ Given the chronicity and intractability of chronic pain, the assessment of satisfaction among patients with chronic pain treatment should therefore focus more on satisfaction with care instead of merely on symptom alleviation.²

A systematic review of 15 epidemiologic studies reported that the prevalence of chronic pain in the general adult population ranged from 2 to 45%.¹² A local population-based study showed that the overall prevalence of some form of chronic pain was ~35%, implying 1.6 million affected adults in Hong Kong.¹³ Moreover, chronic pain has enormous social and economic implications for the health care system and society. People with chronic pain reported greater use of general medical services,^{14, 15} consulting up to five times more frequently than the rest of the population.^{16, 17}

Patient satisfaction research in chronic pain conditions and treatment is scarce both internationally and locally. Good quality doctor-patient communication is generally crucial to satisfaction. Previous research in Chinese nasopharyngeal cancer patients showed perceived social support from family members and health professionals predicted physical and emotional adjustment 3 months after treatment.¹⁸ Dissatisfaction with levels of involvement in treatment decision making before surgery was associated with greater subsequent psychological distress up to 8 months postoperatively among Chinese breast cancer patients,^{19, 20} while greater patient satisfaction is associated with concern-oriented care provision by health professionals for Chinese patients with breast, liver, lung, and nasopharyngeal cancer.^{21, 22} Data generally suggest Asian patients are often more passive, perceiving the doctor as an expert, they often conform the demands of the doctor, who in turn is expected to act in a paternalistic but caring

manner²³ while meeting patient expectations of medication for every ill.

Considering the limited research on satisfaction in the area of chronic pain and the potentially important service and policy implications thereof, identifying predictors of pain treatment satisfaction and its impact on medical compliance in chronic pain in the Chinese cultural context is therefore timely and imperative. This multi-centre longitudinal study examined the relationships amongst pain treatment satisfaction, medical compliance and quality of life (QoL) in a sample of Chinese patients with chronic pain in Hong Kong. This report specifically (1) examined the longitudinal changes of pain treatment satisfaction, medical compliance and quality of life, (2) evaluated whether psychosocial factors and pain treatment satisfaction predicted medical compliance, and (3) compared the predictive ability of psychosocial factors, pain treatment satisfaction and medical compliance in predicting QoL outcomes. We hypothesized that pain treatment satisfaction would be a significant predictor of medical compliance whereas both medical compliance and pain treatment satisfaction would significantly predict the physical but not the mental dimension of QoL.

Methods

Study sample

Following IRB approval, consecutive patients with chronic non-malignant musculoskeletal pain attending two multidisciplinary pain clinics in Hong Kong were invited to participate. Eligible patients met the following criteria: (1) ≥ 18 years of age, (2) native Chinese speakers, (3) no communication, neurological or physical conditions preventing the completion of the interviews and study, (4) chronic non-malignant pain for at least 3 months, and (5) willingness to participate. Eligible patients giving written fully-informed consent were interviewed within clinics by trained research assistants using a structured questionnaire at baseline, and at 3- (FU1) and 6-months (FU2) following baseline.

Measures

Chronic Pain Severity and Disability:

Chronic pain severity and disability was assessed using the Chronic Pain Grade (CPG)

questionnaire,¹⁶ a seven-item instrument that measures three domains of pain severity: persistence, intensity and disability/interference. The CPG classifies subjects into five hierarchical grades (see Table 2). The CPG English version possesses good psychometric properties²⁴ and is responsive to change in pain severity over time.²⁵ The Chinese version of CPG demonstrated good psychometric properties, with Cronbach's alphas for the CPG Disability and Pain Intensity scales of 0.87 and 0.68.²⁶ In the current sample, the Cronbach's alphas were 0.81 for the pain intensity and pain interference scales.

Medical Compliance:

The Participant Compliance Reporting Scale (PCRS) is a 12-item scale designed for assessing level of compliance with 10 treatment recommendations commonly prescribed to patients with chronic pain.⁸ Rating on a centile-scale ("0"=did not do that at all; "100"=did everything that was recommended), the PCRS assesses compliance with recommendations in 10 areas: treatment medications, discontinuation of medications, use of assistive devices, physical therapy exercises, other home treatments, follow-up appointments, and referrals to other health-care professionals, surgical interventions, alternative medicine treatment, and other treatment recommendations. A compliance index was derived by dividing the sum of the levels of compliance with the number of recommendations solicited. The PCRS was translated into Chinese language and assessed on semantic equivalence, which suggested good or excellence equivalence of the item translation.

Pain Treatment Satisfaction:

The Pain Treatment Satisfaction Scale (PTSS) was developed for assessing satisfaction in patients with both acute and chronic pain.²⁷ It consists of 39 items grouped in 5 dimensions: information, medical care, impact of current pain medication, satisfaction with pain medication (which is divided into two subscales: medication characteristics and efficacy), and side effects. The scale demonstrated good internal consistency (Cronbach's alphas ranged from 0.83-0.92). The Chinese version of the PTSS (ChPTSS) assessed in a Chinese pain sample yielded moderately high internal consistency (Cronbach's alphas ranged from 0.77-0.90). The Cronbach's alphas of the ChPTSS in the current sample ranged

between 0.69 and 0.90.

Quality of Life:

QoL was assessed using the Chinese translation of the Medical Outcomes Study 12-item Short-Form Health Survey (SF-12, version 2).²⁸⁻³⁰ The 12 questions are summarized into physical (QoL-Physical) and mental (QoL-Mental) component scores.²⁹ In the current sample, the Cronbach's alphas of QoL-Physical and QoL-Mental were 0.77 and 0.71 respectively.

Depression:

Participants completed the depression subscale (HADS-D) of the Hospital Anxiety and Depression Scale (HADS).³¹ The seven HADS-D items assess non-vegetative symptoms of depression during the past week. Possible scores range between 0 and 21, with higher scores indicating greater levels of depressive symptoms. Internal consistency was high (Cronbach's alpha=0.90),³² with the validated Chinese version yielding good internal consistency and test-retest reliability.^{33, 34} The Cronbach's alpha of HADS-D was 0.85 in this sample.

Pain Catastrophizing:

Pain-related catastrophizing cognitions were assessed using the 13-item Pain Catastrophizing Scale (PCS).³⁵ Respondents indicate the frequency with which they experienced each of 13 thoughts or feelings during recalled pain experiences. The PCS has demonstrated good internal consistency (Cronbach's $\alpha=0.87$), test-retest reliability at 6 weeks ($r=0.75$), and construct validity.³⁵ The Chinese version of PCS also showed good psychometric properties (Cronbach's $\alpha= 0.93$).³⁶ The Cronbach's alpha in the current sample was 0.91.

Pain-Related Fear:

Pain-related fear was assessed by the Tampa Scale for Kinesiophobia (TSK),³⁷ a measure of fear of (re)injury and movement. Rating on a 4-point Likert scale, the TSK consists of 17 items with different

reported factor structures.³⁸⁻⁴¹ The TSK possessed good internal consistency and test-retest reliability.^{41,}
⁴² The Chinese version of TSK which is a 11-item version has been validated and demonstrated acceptable psychometric properties.⁴³ A Cronbach's alpha of 0.75 was seen for the current sample.

Data Analysis

Standard descriptive statistics (mean and standard deviation (SD)) assessed sample sociodemographic, pain and psychosocial characteristics. Linear mixed effects (LME) univariate analyses were performed to evaluate longitudinal changes for pain treatment satisfaction, compliance, and psychosocial variables over time (Baseline, FU1, FU2). Separate LME univariate models were fitted to examine the association between disability grade and all measurement variables with adjustment of time. Disability grade was indexed by the CPG grades, which was entered as one continuous variable instead of four categorical variables. Random subject effects were estimated for the intercept, slope for time (interval between interviews (months)), and time squared (time²), which was included to account for possible nonlinear change over time. To identify predictors of pain treatment satisfaction scores, a multivariate LME model was fitted to the PTSS Satisfaction with Pain Medication subscale score (i.e., the sum of the efficacy and medication characteristics subscale score) (Model 1), with time, psychosocial factors, and medical compliance were assessed as predictors. Three separate multivariate LME models were fitted to the PCRS Compliance Index (Model 2), QoL-Physical (Model 3), and QoL-Mental (Model 4) score to evaluate the impact of time, psychosocial factors, and pain treatment satisfaction on medical compliance and QoL. Medical compliance was evaluated as a predictor in the two QoL models (Model 3 and 4). Time and all psychosocial variables were included as predictors in all models. All models were adjusted for sociodemographic factors significant ($p < 0.05$) in univariate analyses and pain variables (number, duration, and intensity). All analyses were conducted using SPSS version 11.0.

Results

Sample characteristics at baseline

A total of 226 patients (~50% of the sample frame) completed baseline interviews. At FU1, 184 patients (81.4% of baseline) were retained, a drop-out of 18.6%, with 178 patients completing all 3 interviews (Table 1). There were no statistically significant differences ($p>0.05$) in sociodemographic and pain variables between the final sample and the drop-outs.

At baseline, respondents reported an average of 4.17 ($SD=2.90$) pain sites, with 81% reporting multiple pain sites (Table 2), an average pain duration of 7.19 years ($SD=6.15$, range, 6 months to 46 years), and an average of 15.68 days ($SD=26.26$, range, 0-90 days) pain-associated disability in the past 3 months. About 20% of the sample reported suffering from pain for over 10 years. Overall 31% and 23% of the sample were classified by the CPG as Grade III and IV disability respectively. The mean (SD) scores of the sample on medical compliance, pain treatment satisfaction and psychosocial measures are reported in Table 2.

Mean within- and between-group differences in pain intensity, medical compliance, pain treatment satisfaction, and psychosocial measures

A significant quadratic trend was observed for all PTSS scores ($p<0.05$) with $std\beta$ ranging between -0.21 and -0.11, except for satisfaction with information about pain and its treatment, impact of current pain medication, and efficacy ($p>0.05$) (Table 3). Satisfaction with medical care was shown to have a linear upward trend ($std\beta=0.19$, $p<0.001$). No significant time effects were revealed for pain intensity, medical compliance, QoL, and all psychosocial variables assessed ($p>0.05$).

Compared to patients with lower disability grades, patients indicating higher disability grades (higher pain intensity and severely limiting) reported significantly poorer functioning over time: higher pain intensity ($std\beta=0.55$, $p<0.001$), poorer QoL-physical ($std\beta=0.21$, $p<0.01$), more depressive symptoms ($std\beta=0.41$, $p<0.001$), higher pain-related fear ($std\beta=0.19$, $p<0.001$), and higher pain catastrophizing (Rumination: $std\beta=0.19$, $p<0.001$; Magnification: $std\beta=0.24$, $p<0.001$; Helplessness: $std\beta=0.28$, $p<0.001$). However, patients with higher disability grades also demonstrated lower

satisfaction with information about pain and its treatment ($\text{std}\beta=-0.08, p<0.05$) and, surprisingly, better QoL-Mental ($\text{std}\beta=-0.11, p<0.01$) than their lower disability grades counterparts.

Linear Mixed Effects Modeling of Satisfaction with Pain Medication, Medical Compliance, and QoL scores

Apart from the significant quadratic trend ($\text{std}\beta= -0.19, p<0.001$), greater depression ($\text{std}\beta=0.16, p<0.01$) was significantly associated with lower pain treatment satisfaction (Model 1) after adjustment for sociodemographic and pain factors. After adjustment for sociodemographic and pain factors, only higher satisfaction with medication characteristics ($\text{std}\beta=-0.11, p<0.05$) was associated with better medical compliance (Model 2). Considering QoL outcomes, only lower pain-related fear ($\text{std}\beta=-0.18, p<0.01$) significantly predicted better QoL-Physical (Model 3) and lower depression ($\text{std}\beta=-0.14, p<0.05$) better QoL-Mental scores (Model 4) respectively, after controlling for potential confounding factors of sociodemographic and pain variables.

Discussion

We examined the longitudinal associations between pain treatment satisfaction, medical compliance, and QoL over a 6-month period for Chinese patients with chronic non-malignant musculoskeletal pain. As expected, significant associations between disability grade and all measures were found except medical compliance. Patients having higher disability level generally reported poorer wellbeing, with higher pain intensity, higher dissatisfaction with aspects of pain treatment, and poorer QoL and psychosocial functioning, than did the less-pain-disabled patients, with the unexpected exception of having better mental QoL scores. This suggests pain disability significantly differentiates the evolution of patients' pain treatment satisfaction, psychological functioning and QoL. While medical compliance, QoL and psychosocial measures did not display significant time effects, four out of six pain treatment satisfaction subscores varied over time. The differential trajectory of pain treatment satisfaction showed an inverted U-shape: dissatisfaction increased from Baseline to FU1 and thereafter

declined to FU2. Possibly this pattern reflects initial delayed adjustment; patients with chronic pain being more dissatisfied with initial pain treatment perhaps because of unrealistic expectations of relief, then subsequently showing adaptive changes indicating recalibrated expectations of treatment/medical effectiveness.⁴⁴ This pattern may also reflect patients' gradual acceptance of the pain condition. Patients often undertake vigorous quest to find a cure for their pain problems at the beginning. But as the pain persists and their initial attempts are unsuccessful, the patients would gradually come to terms with the reality of learning to "live with" chronic pain.^{45, 46} The process of acceptance is enhanced as the patients become more knowledgeable about their pain condition and learn how best to manage it. An acceptance attitude toward pain on the patients also provides a good basis for doctors to communicate and engage the patients in pain treatment protocols.

This pattern may reflect patients having increased expectations or hopes prior to each clinic visit of some new solution to their problem, only to leave disappointed and as a result experience increasing dissatisfaction subsequently, followed by an adjustment back to more reasonable expectations of limited benefit on existing or alternative medications.

Although results are consistent with our first hypothesis, that pain treatment satisfaction significantly predicted medical compliance, it is important to note that, of the six aspects of pain treatment assessed using the PTSS, only satisfaction with medication characteristics emerged as an independent predictor after full adjustment for sociodemographic and pain variables (Model 2, Table 4). Patients reporting greater satisfaction with pain medication characteristics had better medical compliance. Furthermore, no significant time effect was observed on medical compliance (Table 3). These data taken together suggest that patients' compliance with treatment recommendations remains quite stable over the 6-month period assessed, and greater disability does not increase compliance with pain treatment. Previous research suggested confidence and trust in healthcare providers contributes significantly to patient satisfaction in patients with chronic pain.⁴⁷ However, in our Chinese sample, form of medication, frequency and amount of medication exerted significant influences on medical compliance than did information, side effects of pain medication, and a caring attitude of healthcare providers. These discrepant findings may reflect different patient expectations⁴⁴ and pain service

differences internationally. Good emotional and social support from healthcare professionals was documented to be a strong predictor of higher satisfaction among patients with chronic pain in the West; however, while medical care factors exerted positive effects on patient satisfaction in the current Chinese sample these were non-significant. Because of manpower shortages, patients tend to see a different doctor on each medical consultation visit to the pain clinics in Hong Kong. Large patient volume only allows doctors to spend less than 20 minutes for each consultation. Such a service model poses a major barrier to building rapport and effective communication between doctors and patients. As a result with limited social and emotional support from healthcare providers, pain patients might adjust their expectation by focusing more on their pain medication, such as the form, frequency and amount of medication as prescribed, instead of expecting medical care.

Contrary to our hypothesis, neither medical compliance nor pain treatment satisfaction predicted QoL outcomes in the current sample. After adjusting for sociodemographic and pain variables, lower pain-related fear and lower depression were significant independent predictors of better “mental” QoL and “physical” QoL respectively. These findings substantiate previous data on pain-related fear being one of the most salient personality traits associated with pain adjustment outcomes⁴⁸⁻⁵⁰ and depression being a common comorbid condition of chronic pain.^{51, 52} Good medical compliance and high pain treatment satisfaction appear to have limited positive effects in this sample on QoL. Rather, managing patients’ depressive symptoms and emotional response to pain is the key to improve patients’ overall QoL. On the other hand, our data departs from previous studies among Chinese cancer patients that patient satisfaction contributed significantly to the prediction of QoL.^{21, 22} However, this might be a coincidental finding, with common factors, such as effective medication improving both satisfaction and QoL. Hence, even within the same ethnic and cultural group, patients suffering from different diseases show varying satisfaction with different aspects of care, partly reflecting variability in expectations, treatments, prognosis and disease trajectories.

Interestingly, while satisfaction with medication efficacy did not display significant time effects in univariate analyses (Table 2), a significant quadratic longitudinal effect of satisfaction with pain medication (Model 1, Table 3) was found in the multivariate model. Sociodemographic and pain factors

remained significant predictors of the outcomes assessed in the four multivariate models tested. In contrast to previous reports that older age is associated with higher satisfaction,⁵³ we found age was inversely associated with pain treatment satisfaction. The association between higher pain intensity and lower pain treatment satisfaction is consistent with previous reports.^{9, 11, 54} The finding that patients in employment reported lower medical compliance reflects over half of the current sample being in active employment status. Factors related to work settings such as job nature and specific work requirements, such as shift hours or customer service activities, may present barriers to following the prescribed medication regimen. Some patients attending local pain clinics reported no longer benefitting from oral and/or other take-home medication, and their last resort is medication injection. For employed patients taking time off from work to visit the pain clinic for their injection may not always be feasible.

In conclusion, our findings offer the first published preliminary data on the longitudinal relationships between pain treatment satisfaction, medical compliance and QoL among Chinese patients with chronic pain. While our univariate and multivariate LME modeling demonstrated longitudinal associations between assessed variables, we did not consider possible interactions between variables that derive from the satisfaction-compliance-QoL relationship. Future research employing structural equation modeling approaches would allow examination of potential non-linear relationships. Also, while musculoskeletal pain conditions were the dominant pain problems in the current sample, some patients might also have more complex pain problems, such as neuropathic, vascular, and oncogenic pain syndromes. Caution should be exercised when interpreting and generalizing the current findings as patients with different types of pain may have different expectations of pain treatment. The implications for clinical practice especially in ethnically diverse healthcare settings are significant. Clinicians should titrate their care and pain medication prescription to the changing trajectory of patients according to their expectations, pain intensity and disability level while addressing psychosocial dimension of satisfaction and mood.. (word count: 3,060)

Acknowledgement

This project was supported by Health & Health Services Research Fund, HKSAR (Project #: 10112131) awarded to the first author (WS Wong). The authors would like to acknowledge support from the Pain Unit of two public hospitals in Hong Kong: the Alice Ho Mui Ling Nethersole Hospital and the Queen Elizabeth Hospital. We also thank all patients for their participation in the project.

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Table 1: Baseline Sociodemographic Profile of the Sample (n=226)

Socio-demographic characteristics	%
Gender	
Male	34.1
Female	65.9
Age in year; M (SD)	44.89 (9.24)
18-29	9.5
30-39	16.6
40-49	38.4
50-59	35.5
Monthly household income^a	
<HK\$15,000	51.5
\$15,000-\$24,999	15.7
\$25,000-\$39,999	14.6
\$40,000-\$59,999	12.1
≥\$60,000	6.1
Marital status	
Never married	28.4
Married/Cohabiting	55.0
Divorced/Separated	14.2
Widowed	2.4
Education level	
No schooling/Pre-primary	0.5
Primary	10.9
Secondary	59.7
Matriculation	5.7
Post-secondary	9.0
Tertiary	14.2
Religion	
No religion	59.7
Catholic	6.2
Christian	19.0
Buddhism/Daoism/Ancestor Worship	15.2
Employment status	
Full time	37.0
Part time	5.7
Retired	3.3
Unemployed	27.5
Housewife	17.1
Student	0.5
Others	9.0

Note: Figures are percentages unless otherwise stated.

^a \$1 U.S. = \$7.8 HK; Missing=13.

Table 2: Baseline Pain and Psychosocial Characteristics of the Sample (n=226)

Pain and Psychosocial Characteristics	%
Number of pain sites; M (SD)	4.17 (2.90)
1	19.0
2	17.1
3-5	38.4
≥6	25.6
Pain site^a	
Lower back	75.8
Leg	48.8
Shoulder	46.0
Neck	45.0
Arm	34.1
Knee	30.3
Upper back	25.6
Pelvic	21.8
Headache	19.0
Muscle	11.4
Joint	9.5
Facial	15.7
Stomach	3.8
Chest	3.3
Abdominal	3.3
Others	33.6
Pain duration (years); M (SD)	7.19 (6.15)
≥ 3 months - 2 years	18.0
> 2 years - 5 years	32.7
> 5 years - 10 years	28.0
> 10 years	20.4
Pain intensity^b; M (SD)	
Present pain	5.16 (2.34)
Average pain	6.01 (1.89)
Worst pain	8.22 (1.89)
Pain interference^b; M (SD)	
Daily activities	5.72 (2.62)
Social activities	6.09 (3.06)
Working ability	6.16 (2.93)
Pain associated disability (days); M (SD)	15.68 (26.26)
Chronic Pain Grade classification^c	
Grade Zero	---
Grade I	11.9
Grade II	34.3
Grade III	30.5
Grade IV	23.3
Medical Compliance^d; M (SD)	79.58 (19.26)
Pain treatment satisfaction^b; M (SD)	
Information about pain and its treatment	13.03 (4.13)
Medical care	17.79 (4.06)
Impact of current pain medication	27.44 (7.69)

Side effects of medication	25.26 (11.46)
Satisfaction with current pain medication	16.19 (4.13)
Medication efficacy	8.72 (2.43)
Medication characteristics	7.64 (2.09)
Quality of life^d; M(SD)	
Physical	31.63 (8.09)
Mental	33.22 (6.96)
Depression^b; M (SD)	10.29 (5.81)
Pain-related fear^b; M (SD)	31.07 (5.88)
Pain catastrophizing^b; M (SD)	26.71 (14.73)
Rumination	8.71 (5.34)
Magnification	6.04 (4.06)
Helplessness	11.96 (7.49)

Notes: Figures are percentages unless otherwise stated. The pain intensity and pain interference scores, and CPG classification were derived based on the CPG questionnaire; Medical compliance was indexed by the Compliance Index deriving from the PCRS; Pain treatment satisfaction was indexed by the PTSS; Quality of life was indexed by SF-12; Depression was indexed by the depression subscale of the HADS; Pain-related fear was indexed by the TSK; Pain catastrophizing was indexed by the PCS. Missing data for pain interference on daily activities and working ability was 1, and PTSS satisfaction with medication efficacy was 4.

^a Multiple responses allowed.

^b Higher scores indicate higher pain intensity, higher level of interference, lower satisfaction, or poorer functioning.

^c Grade Zero: no pain; Grade I: low disability-low intensity; Grade II: low disability-high intensity; Grade III: high disability-moderately limiting; Grade IV: high disability-severely limiting.

^d Higher scores indicate higher compliance or better functioning.

Table 3: Univariate Linear Mixed Effect Analysis: Mean Comparison of Pain Intensity, Medical Compliance, Pain Treatment Satisfaction and Psychosocial Covariate Across Time and Between Pain Disability Grade

Variable	Baseline				FU1				FU2				Standardized β Coefficient		
	Disability Grade ^a				Disability Grade ^a				Disability Grade ^a				Time	Time ²	Disability Grade
	I	II	III	IV	I	II	III	IV	I	II	III	IV			
Pain intensity ^b	34.80	63.43	71.56	73.47	37.38	63.27	71.21	70.94	36.90	65.61	69.74	79.44	0.03	0.04	0.55***
Medical compliance ^c	80.99	79.29	79.89	78.47	78.29	76.23	83.19	78.50	69.12	79.09	79.13	77.29	-0.05	-0.04	0.04
Pain treatment satisfaction ^b															
Information about pain and its treatment	13.80	12.94	12.94	12.76	13.18	13.62	13.15	12.36	13.83	13.61	13.10	12.17	0.03	-0.00	-0.08*
Medical care	17.92	17.18	17.98	18.29	18.75	19.38	19.25	20.62	18.62	19.70	20.25	19.30	0.19***	-0.13**	0.09*
Impact of current pain medication	23.24	26.81	28.45	29.20	25.62	25.45	30.33	32.26	24.43	26.52	28.71	31.63	0.04	-0.08	0.27***
Side effects	20.04	23.44	27.34	28.02	17.92	27.19	29.23	31.08	20.30	23.25	26.71	33.57	0.02	-0.11*	0.25***
Satisfaction of current pain medication	15.48	15.06	16.44	17.86	15.62	17.15	17.61	18.77	14.43	16.31	17.02	18.67	0.66	-0.17**	0.23***
Efficacy	7.68	8.10	8.90	9.92	8.08	8.60	9.26	9.97	7.48	8.67	8.94	9.80	0.03	-0.08	0.26***
Medication characteristics	7.80	7.07	7.81	8.14	7.54	8.55	8.35	8.79	6.96	7.78	8.08	8.87	0.08	-0.21***	0.16***
Quality of life ^c															
Physical	34.09	33.18	31.14	28.89	33.50	35.38	28.46	28.04	32.47	31.98	30.33	30.29	-0.03	0.01	-0.21***
Mental	30.41	33.10	33.13	34.84	31.51	31.16	35.16	33.59	31.00	33.71	34.48	31.80	0.01	0.01	0.11**
Depression ^b	6.48	7.68	12.14	13.53	6.61	7.58	10.61	15.00	7.17	6.76	11.98	13.57	-0.02	0.01	0.41***
Pain-related fear ^b	30.32	29.01	32.11	33.08	32.14	30.56	32.01	34.28	29.41	30.17	32.48	35.00	0.04	-0.08	0.19***
Pain catastrophizing ^b															
Rumination	7.28	7.35	10.23	9.63	6.79	7.92	8.82	9.66	6.55	6.86	9.06	9.63	-0.05	0.00	0.19***
Magnification	4.68	4.75	7.22	7.20	4.07	5.26	5.19	6.95	3.45	4.03	6.58	7.70	-0.06	0.06	0.24***
Helplessness	8.24	9.24	14.75	14.31	7.75	10.06	11.70	13.47	6.76	8.08	12.52	15.30	-0.07	0.03	0.28***

Notes: Standardized β coefficients obtained from LME analysis that examined differences of mean scores across time (from Baseline to FU2) and the association between disability grade and all measurement variables. Each LME model included terms for Time and Time². Random effects were estimated for the intercept, slope for Time and Time². Pain intensity and Disability grade were derived based on CPG classification; Medical compliance was indexed by the Compliance Index of the PCRS; Pain treatment satisfaction was indexed by the PTSS; Quality of life was indexed by SF-12; Depression was indexed by the depression subscale of the HADS; Pain-related fear was indexed by the TSK; Pain catastrophizing was indexed by the PCS. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^a Grade Zero: no pain; Grade I: low disability-low intensity; Grade II: low disability-high intensity; Grade III: high disability-moderately limiting; Grade IV: high disability-severely limiting. The percentages for the 4 CPG grades (I to IV) at FU1 were 15.2%, 27.1%, 36.4%, and 21.2% respectively. The percentages for the 4 CPG grades (I to IV) at FU2 were 16.4%, 37.3%, 29.4%, and 16.9% respectively.

^b Higher scores indicate higher pain intensity, lower satisfaction, or poorer functioning.

^c Higher scores indicate higher compliance or better functioning.

Table 4: Multivariate Linear Mixed Effect Models for Satisfaction of Pain Medication, Medical Compliance, and QoL

Predictor	Model 1			Model 2			Model 3			Model 4		
	Satisfaction of Pain Medication			Medical Compliance			QoL-Physical			QoL-Mental		
	Std β	SE	95% CI	Std β	SE	95% CI	Std β	SE	95% CI	Std β	SE	95% CI
Time factor												
Time	0.05	0.04	-0.03, 0.13	0.00	0.04	-0.09, 0.09	-0.02	0.04	-0.11, 0.06	0.01	0.05	-0.08, 0.10
Time ²	-0.19***	0.05	-0.29, -0.10	-0.07	0.05	-0.17, 0.04	0.00	0.05	-0.11, 0.11	0.02	0.06	-0.09, 0.14
Sociodemographic factor												
Age	0.11*	0.05	0.01, 0.21	0.08	0.05	-0.02, 0.19	-0.11*	0.05	-0.21, 0.00	-0.02	0.06	-0.12, 0.09
Sex (male)	-0.15	0.11	-0.36, 0.06	0.12	0.11	-0.10, 0.35	0.23*	0.11	0.01, 0.45	0.03	0.12	-0.20, 0.26
Marital status (single)	-0.08	0.11	-0.29, 0.13	-0.12	0.11	-0.34, 0.10	0.12	0.11	-0.09, 0.34	0.20	0.12	-0.03, 0.43
Education (bachelor or above)	0.01	0.15	-0.27, 0.30	-0.25	0.15	-0.55, 0.05	0.30*	0.15	0.00, 0.59	0.17	0.16	-0.15, 0.48
Occupation (working)	0.12	0.11	-0.09, 0.33	-0.26*	0.11	-0.48, -0.04	0.08	0.11	-0.14, 0.30	-0.27*	0.12	-0.51, -0.06
Endorsing a religion (yes)	0.04	0.09	-0.15, 0.23	0.09	0.10	-0.10, 0.29	0.18	0.10	-0.01, 0.37	-0.24*	0.10	-0.44, -0.03
Family monthly income	-0.02	0.06	-0.13, 0.09	0.03	0.06	-0.08, 0.14	0.08	0.06	-0.03, 0.19	-0.01	0.06	-0.13, 0.10
Pain-related factor												
No. of pain site	0.00	0.05	-0.10, 0.10	0.03	0.05	-0.07, 0.13	-0.11*	0.05	-0.21, -0.01	0.03	0.05	-0.08, 0.13
Pain duration	0.00	0.05	-0.09, 0.10	-0.10	0.05	-0.19, 0.00	0.11*	0.05	0.02, 0.21	-0.03	0.05	-0.14, 0.07
Pain intensity	0.17***	0.05	0.08, 0.26	0.02	0.05	-0.08, 0.12	0.03	0.05	-0.07, 0.13	0.12*	0.05	0.02, 0.23
Psychosocial factor												
Depression	0.16**	0.05	0.05, 0.26	-0.01	0.07	-0.14, 0.12	-0.11	0.06	-0.24, 0.02	-0.14*	0.07	-0.27, 0.00
Pain-related fear	0.01	0.05	-0.09, 0.11	0.00	0.06	-0.11, 0.11	-0.18**	0.06	-0.29, -0.07	0.10	0.06	-0.02, 0.21
Pain catastrophizing: Rumination	-0.05	0.05	-0.15, 0.05	0.04	0.06	-0.07, 0.15	0.03	0.06	-0.08, 0.14	-0.03	0.07	-0.27, 0.00
Pain catastrophizing: Magnification	-0.04	0.06	-0.16, 0.08	-0.08	0.06	-0.20, 0.05	0.00	0.06	-0.13, 0.12	0.00	0.06	-0.15, 0.09
Pain catastrophizing: Helplessness	0.10	0.06	-0.02, 0.22	0.07	0.07	-0.06, 0.20	0.09	0.07	-0.03, 0.22	-0.01	0.07	-0.13, 0.14
Medical compliance	-0.07	0.04	-0.16, 0.01	--	--	--	-0.06	0.05	-0.15, 0.03	0.09	0.05	0.00, 0.19
Pain treatment satisfaction												
Information about pain and its treatment	--	--	--	-0.01	0.05	-0.11, 0.09	-0.03	0.50	-0.13, -0.09	-0.09	0.05	-0.19, 0.02
Medical care	--	--	--	-0.06	0.05	-0.16, 0.03	-0.03	0.05	-0.12, -0.04	-0.04	0.05	-0.14, 0.07
Impact of current pain medication	--	--	--	-0.04	0.05	-0.14, 0.06	-0.04	0.05	-0.14, 0.01	0.01	0.06	-0.10, 0.12
Side effects	--	--	--	0.08	0.05	-0.02, 0.18	-0.07	0.05	-0.17, -0.02	-0.02	0.05	-0.12, 0.09
Efficacy	--	--	--	0.02	0.05	-0.09, 0.12	0.07	0.05	-0.03, -0.05	-0.05	0.06	-0.16, 0.06
Medication characteristics	--	--	--	-0.11*	0.05	-0.21, -0.01	0.01	0.05	-0.09, 0.02	0.02	0.06	-0.09, 0.13

Notes: Each LME model included terms for Time, Time² and disability grade. Random effects were estimated for the intercept, slope for Time and Time². Quality of life was indexed by SF-12; Medical compliance was indexed by the Compliance Index of the PCRS; Pain treatment satisfaction was indexed by the PTSS; Depression was indexed by the depression subscale of the HADS; Pain-related fear was indexed by the TSK; Pain catastrophizing was indexed by the PCS. Std β denotes standardized beta coefficients; SE indicates standard error. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.